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The Effect of Hurricane Katrina: Births in the U.S. Gulf Coast Region, Before and After the Storm

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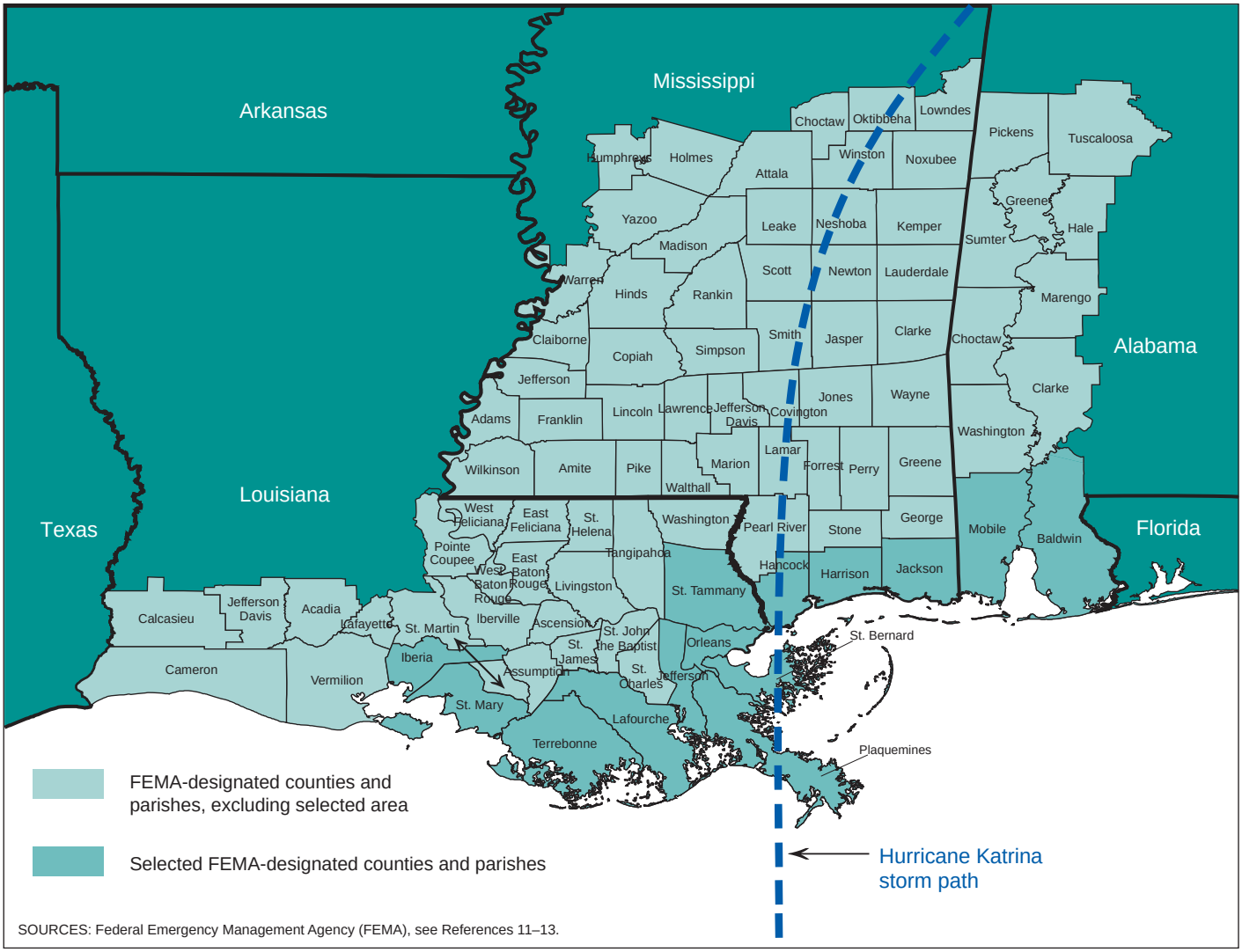

Figure 1. 91 FEMA-designated counties and parishes of Hurricane Katrina disaster, showing storm path

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Abstract

Objectives—This report presents birth data for the region affected by Hurricane Katrina, which made landfall along the Gulf Coast of the United States on August 29, 2005, comparing the 12-month periods before and after the storm according to a wide variety of characteristics. Data are presented for maternal demographic characteristics including age, race, Hispanic origin, marital status, and educational attainment; medical care utilization by pregnant women (prenatal care and method of delivery); and infant characteristics or birth outcomes (period of gestation and birthweight).

Methods—Descriptive tabulations of data reported on the birth certificates of residents of the 91 Federal Emergency Management Agency (FEMA)-designated counties and parishes of Alabama, Louisiana, and Mississippi are presented for the 12-month periods before and after Hurricane Katrina struck, from August 29, 2004, through August 28, 2006. Detailed data are shown separately for 14 selected, FEMA-designated coastal counties and parishes within a 100-mile radius of the Hurricane Katrina storm path, the area hit very hard by the storm and subsequent flooding. These 14 selected coastal counties and parishes are a subset of the 91 FEMA-designated counties and parishes.

Results—The total number of births in the 14 selected FEMA-designated counties and parishes decreased 19 percent in the 12 months after Hurricane Katrina compared with the 12 months before, with births declining in the selected counties and parishes of Louisiana and Mississippi and rising in the counties of Alabama. The number of births to non-Hispanic black women in the selected parishes of Louisiana fell substantially after Hurricane Katrina; births declined for non-Hispanic white, Hispanic, and Asian or Pacific Islander women in these selected parishes as well. The percentage of births to women under age 20 years for the selected counties and parishes after the storm was essentially unchanged in Alabama and Mississippi, but decreased in Louisiana. The proportion of births to unmarried women decreased in the selected parishes of Louisiana, but increased in the selected counties elsewhere. Large decreases were observed in very preterm and very low birthweight rates for the selected parishes of Louisiana following Hurricane Katrina, whereas a large increase was observed in very preterm births for the selected counties of Alabama.

Keywords: births • maternal and infant health • maternal characteristics • birth certificate

Highlights

- The number of births in the 14 selected, Federal Emergency Management Agency (FEMA)-designated counties and parishes fell 19 percent in the 12-month period after Hurricane Katrina. Births decreased by 30 percent for the selected parishes in Louisiana and 13 percent for the selected counties in Mississippi, but increased by 6 percent for the selected counties in Alabama.
- The number of births decreased for non-Hispanic white women (9 percent), Hispanic women (11 percent), Asian or Pacific Islander (API) women (26 percent), and non-Hispanic black women (36 percent) in the 14 selected FEMA-designated counties and parishes, with the largest declines in Louisiana.
- In Orleans Parish, the central parish of New Orleans, the proportion of births to non-Hispanic black women fell substantially after Hurricane Katrina, from 78 percent of births before the storm to 60 percent.
- The proportion of births to women under age 20 years for the 14 selected FEMA-designated counties and parishes was essentially unchanged after Hurricane Katrina from the same period before, but decreased 11 percent for the selected parishes in Louisiana.
- The proportion of births to unmarried women decreased 10 percent in the selected FEMA-designated parishes of Louisiana, but increased in the selected counties elsewhere.
- The percentage of births to women who completed 16 or more years of school was 12 percent higher for the 14 selected FEMA-designated counties and parishes after the hurricane, with the increase generally centered in the selected parishes of Louisiana.
- Notable increases in the receipt of late or no prenatal care for the 14 selected counties and parishes were observed for births to non-Hispanic white women in Alabama, non-Hispanic black women in Mississippi, and Hispanic women in Louisiana.
- The cesarean delivery rate for the 14 selected FEMA-designated counties and parishes rose by 10 percent for the counties in Alabama and Mississippi and 6 percent for the parishes in Louisiana.
- Large decreases were observed in very preterm and very low birthweight rates for the selected FEMA-designated parishes in Louisiana for the 12-month period following Hurricane Katrina. In contrast, a large increase was observed in very preterm births for the selected FEMA-designated counties in Alabama after the hurricane.

Introduction

An estimated 10 million people residing along the Gulf Coast of the United States were impacted by Hurricane Katrina, with an estimated 1.5 million people (aged 16 years and older) evacuating from their homes (1–5). Those people who remained faced shortages of potable water, food, health care, and utility services, as well as long-term health risks from communicable disease outbreaks and environmental contaminants directly or indirectly associated with the storm (6–10). This report provides information on the possible effects of Hurricane Katrina on fertility patterns, according to such characteristics as age, race and Hispanic origin, marital status, and educational attainment. Information on differences in medical care utilization and birth outcomes is also presented, including use of prenatal care, method of delivery, period of gestation, and birthweight by maternal demographic characteristics. Monitoring data on birth outcomes, especially levels of low birthweight and preterm birth, is essential, because these factors are important predictors of infant mortality and morbidity.

Detailed data on the numbers and characteristics of births for the Hurricane Katrina-affected areas are presented for the 12-month periods before and after the storm.

Methods

Data shown in this report are based on births to residents of the *total FEMA-designated disaster counties and parishes* of Alabama,

Louisiana, and Mississippi for the 12-month periods before and after Hurricane Katrina, from August 29, 2004, through August 28, 2006. The area encompasses 91 counties or parishes eligible to receive individual assistance (assistance to individuals and households) and public assistance (assistance to state and local governments and certain private nonprofit organizations for the repair or replacement of disaster-damaged facilities) based on the disaster declarations issued by FEMA (11–13). Data are examined in more detail for a 14-county-or-parish subset of the 91 FEMA-designated counties and parishes, that is, coastal counties or parishes within a 100-mile radius of the Hurricane Katrina storm path (see Figure 1 and "Technical Notes"). These 14 selected counties and parishes represent the area hit very hard by the storm and subsequent flooding (1–3,6) (for the names of the counties and parishes, see Figure 1 and "Technical Notes"). The remaining counties and parishes of Alabama, Louisiana, and Mississippi not identified as a FEMA-designated county or parish are referred to collectively as the remaining portion or balance of the state(s). Text references to the *total 91 FEMA-designated* counties and parishes and "total counties and parishes or area," or the *selected 14 FEMA-designated* counties and parishes and "selected counties and parishes or area," are used interchangeably for ease in writing. Furthermore, text references to parishes and counties are used interchangeably, again for ease in writing.

The data shown are provided to the National Center for Health Statistics through the Vital Statistics Cooperative Program (VSCP). The data are based on 100 percent of the birth certificates filed in all states and the District of Columbia for 2004, 2005, and 2006 (14–17).

Race and Hispanic origin are reported independently on the birth certificate. Tables in this report show data for the three largest race and Hispanic origin groups: non-Hispanic white, non-Hispanic black, and Hispanic. The number of births is also shown for American Indian or Alaska Native and API women in some tables, but the characteristics of births to women in these groups are not shown due to small numbers. Information on the reporting of race and Hispanic origin and changes in the birth certificate data is presented in "Technical Notes" and elsewhere (18–23).

This report includes data on items that are collected on both the 1989 revision of the U.S. Standard Certificate of Live Birth and the 2003 revision of the U.S. Standard Certificate of Live Birth. The 2003 revision is described in detail elsewhere (24,25). Alabama, Louisiana, and Mississippi, which encompass the FEMA-designated disaster counties and parishes impacted by Hurricane Katrina, had not implemented the 2003 revised birth certificate as of August 29, 2006 (14–16). Nevertheless, births to residents of Alabama, Louisiana, and Mississippi that occurred in states that had adopted the 2003 revision are included. Information on educational attainment and prenatal care, which is collected on both the 1989 and the 2003 revisions of the U.S. Standard Certificate of Live Birth, is not considered comparable between revisions (see "Technical Notes"). Accordingly, data on educational attainment and prenatal care for births occurring in states that had adopted the 2003 revision are excluded from all tabulations. Information on 0.2 percent of births before and 1.0 percent of births after Hurricane Katrina to residents of the three states are excluded for this reason (see "Technical Notes").

Information on the measurement of marital status, gestational age, and birthweight; the computation of percentages and percent distributions; and random variation and significance testing for natality data are presented in the "Technical Notes."

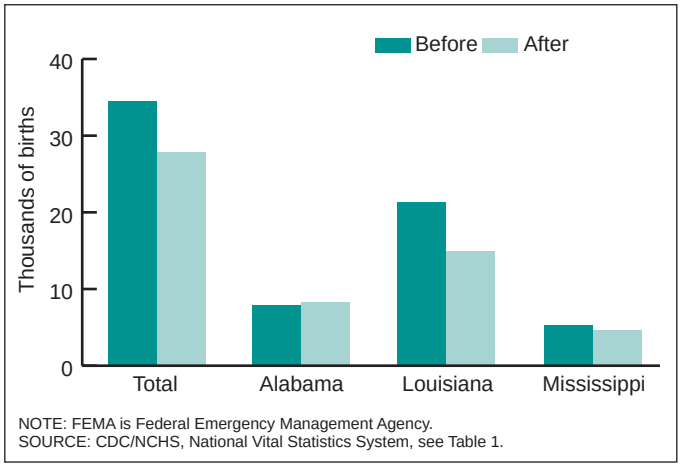
Results

Demographic characteristics

This section describes the changes in composition of women giving birth in the Katrina-impacted areas. Population estimates for the region from the U.S. Census Bureau showed substantial declines between July 1, 2005, and January 1, 2006, with Orleans Parish, Louisiana, losing more than 275,000 people (5). U.S. Census Bureau analyses suggest, too, that the demographic composition of the region changed following Hurricane Katrina. For example, the number of younger people and African Americans in the FEMA-designated parishes of Louisiana declined substantially in the 3 months after the storm (3). The rehabilitation and rebuilding effort in the aftermath of the disaster also brought a large influx of Hispanic immigrants to the area (4).

Births

The number of births in the 14 selected FEMA-designated counties and parishes—a subset of the 91 FEMA-designated counties or parishes—fell 19 percent in the 12-month period after Hurricane Katrina, as expected (Table 1 and Figure 2). Births decreased by 30 percent for those Louisiana parishes that were hit very hard by the storm and subsequent flooding, and 13 percent for the selected counties in Mississippi, but increased by 6 percent for the selected counties in Alabama. Changes in the total FEMA-designated counties and parishes were smaller: Births fell by 12 percent in the total FEMA-designated parishes of Louisiana and rose in the total FEMA-designated counties of Alabama by 4 percent and Mississippi by



NOTE: FEMA is Federal Emergency Management Agency.
SOURCE: CDC/NCHS, National Vital Statistics System, see Table 1.

Figure 2. Number of births, by state: 14 selected FEMA-designated counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)

3 percent (Table 2). In the remaining portions of the three states (the balance of the states), births increased by 3 percent for each state (tabular data not shown).

The number of births decreased to non-Hispanic white women (9 percent), Hispanic women (11 percent), API women (26 percent), and non-Hispanic black women (36 percent) for the 14 selected counties and parishes (Figure 3), with the largest significant declines in the selected parishes of Louisiana (non-Hispanic white, down 14 percent; Hispanic, 21 percent; API, 34 percent; and non-Hispanic black, 51 percent). The sharp drop in births to non-Hispanic black women in the selected parishes of Louisiana is particularly striking. In the 12 months before Hurricane Katrina, births to non-Hispanic black women in the selected Louisiana parishes totaled 9,296, or 44 percent of all births in these parishes (Table 1). After Hurricane Katrina, the number of births to non-Hispanic black women fell by over one-half to 4,575, or 31 percent of all births in the following 12-month period.

For the total 91 FEMA-designated counties and parishes, the number of births to non-Hispanic white, non-Hispanic black, and API women decreased as well, with large declines in the total designated parishes of Louisiana (Table 2). Births to Hispanic women decreased 11 percent in the Louisiana parishes in the 12-month period after the storm, but increased by a substantial 28 percent in the total designated counties of Mississippi. This increase may reflect the influx of Hispanic immigrants in response to the massive commercial rebuilding effort in Mississippi after the storm.

Births by county or parish

The number of births to residents in the 91 FEMA-designated counties and parishes in the 12 months after Hurricane Katrina fell significantly in six counties or parishes when compared with the 12 months before the storm (Table 3 and Figure 4). All six of these counties are located on the coast and within 100 miles of where Katrina made landfall (i.e., are included among the *selected* FEMA-designated counties or parishes; see Figure 1). Of these six counties, four are in Louisiana (Jefferson, Orleans, Plaquemines, and St. Bernard) and two are in Mississippi (Hancock and Harrison). In Orleans Parish, the most populated of the six counties prior to Hurricane Katrina, the number of births to residents fell by a steep 69 percent. Among all six counties or parishes, declines in the number of births ranged from 82 percent in St. Bernard Parish to 18 percent in Jefferson Parish and Harrison County.

In the aftermath of Hurricane Katrina, large numbers of people were displaced (1–5). While some of these displaced people left the area completely, others relocated to another of the 91 FEMA-designated counties (2,3,5). The number of births to residents of 7 of the 91 counties or parishes increased significantly in the 12 months following the storm. The seven include three parishes in Louisiana (Ascension, East Baton Rouge, and Tangipahoa) and four counties in Mississippi (Jefferson Davis, Lowndes, Madison, and Wayne).

The New Orleans Metropolitan Area, consisting of Jefferson, Orleans, Plaquemines, St. Bernard, St. Charles, St. John the Baptist, and St. Tammany parishes, was hit very hard by Hurricane Katrina and the subsequent flooding (1,2,6). The number of births to women residing in the New Orleans Metropolitan Area fell by 35 percent in the 12 months after the storm when compared with the previous 12-month period (see parishes in Table 3).

With this decline in the number of births to residents in the New Orleans Metropolitan Area has come a marked change in the race and Hispanic origin composition of the mothers. In the 12 months before Hurricane Katrina, 47 percent of the births to residents of the New Orleans Metropolitan Area were to non-Hispanic black women and 44 percent were to non-Hispanic white women. In the 12 months after the storm, 34 percent of births to residents in the New Orleans Metropolitan Area were to non-Hispanic black women and 57 percent were to non-Hispanic white women (tabular data not shown).

In Orleans Parish, which is the central parish of the New Orleans Metropolitan Area, the majority of births were to non-Hispanic black women both before and after Hurricane Katrina, but the proportion of births to non-Hispanic black women fell significantly after the storm. In the 12 months prior to Hurricane Katrina, 78 percent of births were to non-Hispanic black women compared with 60 percent in the 12-month period following the hurricane.

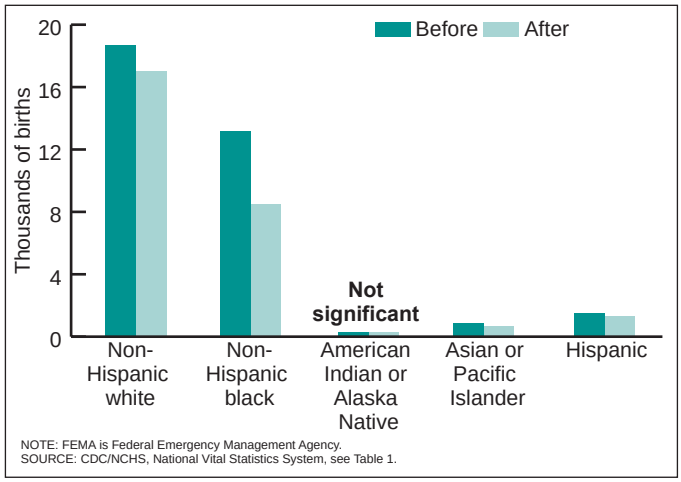
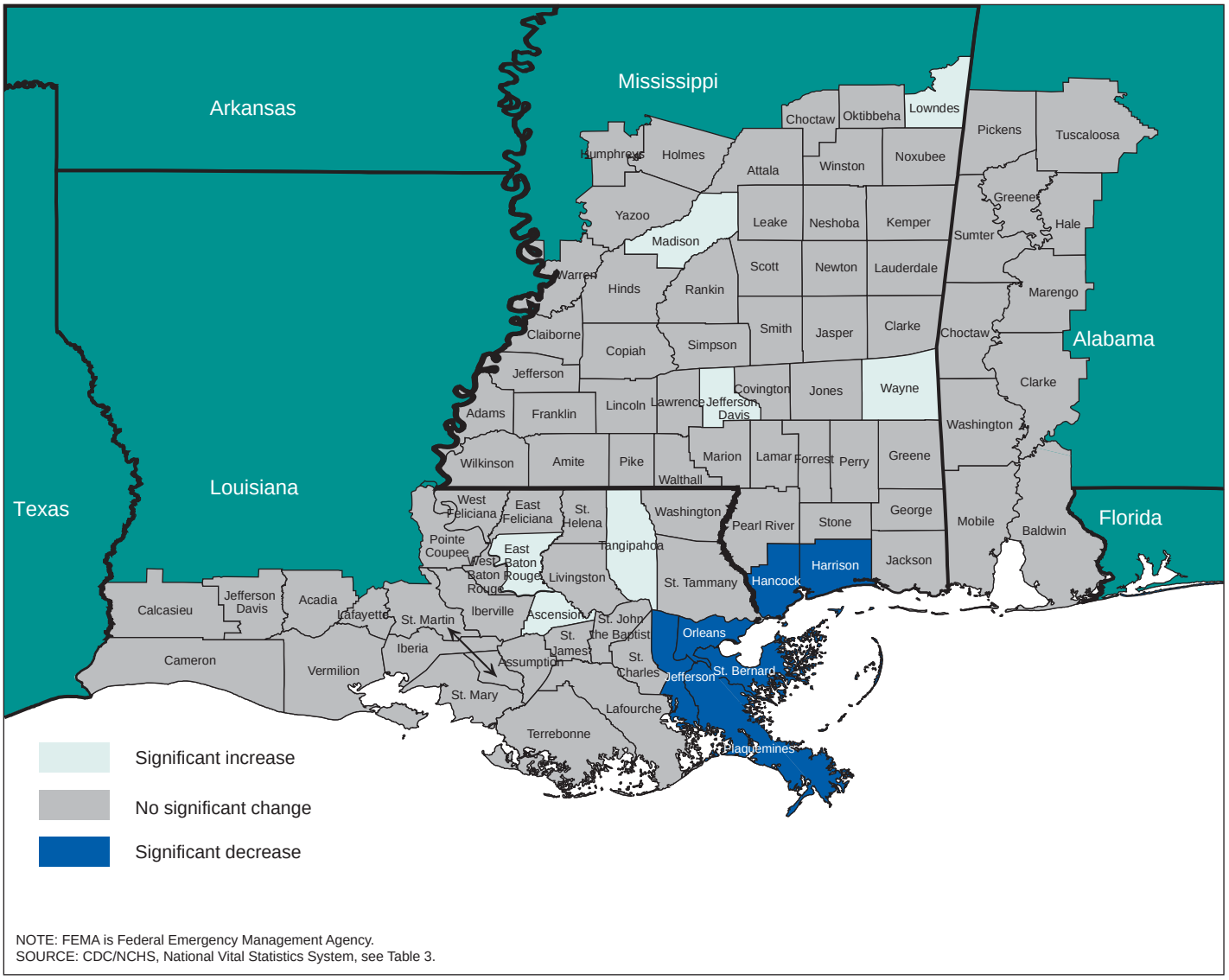


Figure 3. Number of births, by race and Hispanic origin of mother: 14 selected FEMA-designated counties and parishes of Alabama, Louisana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)

Month of birth

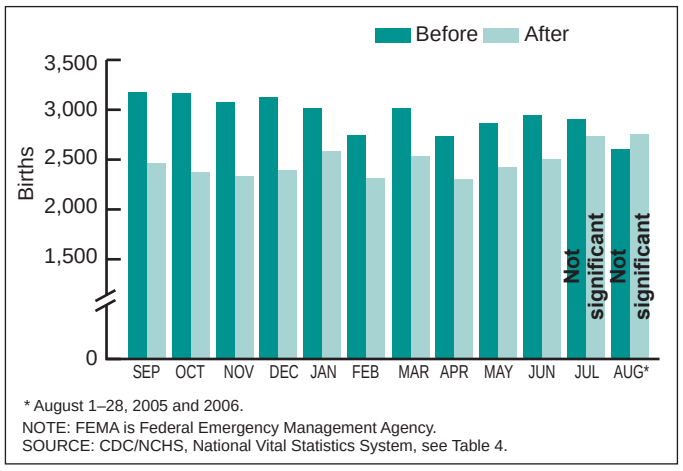
In the selected FEMA-designated area (14 coastal counties and parishes close to the storm's path), births declined significantly in the 10 months immediately following Hurricane Katrina—September 2005 through June 2006—compared with those same months before the storm (Table 4 and Figure 5). The year-to-year declines for September, October, November, and December, the 4 months immediately following the storm, were close to 30 percent in 2005 compared with 2004, while in later subsequent months, declines approached 20 percent, reflecting the gradual return of people to the area. In the selected parishes of Louisiana, the number of births in October 2005 was 45 percent lower than the number of births in October 2004 (Figure 6).

For the total FEMA-designated area (all 91 counties and parishes), the first 4 months after the hurricane (September–December 2005) showed significant but smaller declines than the selected FEMA-designated counties and parishes in the number of births compared with those same months before the hurricane (Table 5). In sharp contrast, July and August (28 days only) of 2006 showed increases in the number of births (6 and 14 percent, respectively) in the total FEMA-designated area compared with July and August of 2005.



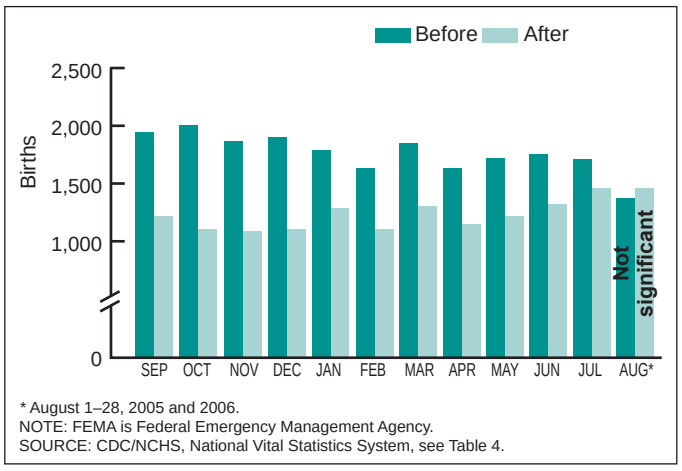
NOTE: FEMA is Federal Emergency Management Agency.
SOURCE: CDC/NCHS, National Vital Statistics System, see Table 3.

Figure 4. Changes in number of births, by mother's county or parish of residence: 91 FEMA-designated counties and parishes of Hurricane Katrina disaster, 12-month periods before and after Hurricane Katrina (August 29, 2005)



* August 1–28, 2005 and 2006.
NOTE: FEMA is Federal Emergency Management Agency.
SOURCE: CDC/NCHS, National Vital Statistics System, see Table 4.

Figure 5. Number of births, by month: 14 selected FEMA-designated counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)



* August 1–28, 2005 and 2006.
NOTE: FEMA is Federal Emergency Management Agency.
SOURCE: CDC/NCHS, National Vital Statistics System, see Table 4.

Figure 6. Number of births, by month: 9 selected FEMA-designated parishes in Louisiana, 12-month periods before and after Hurricane Katrina (August 29, 2005)

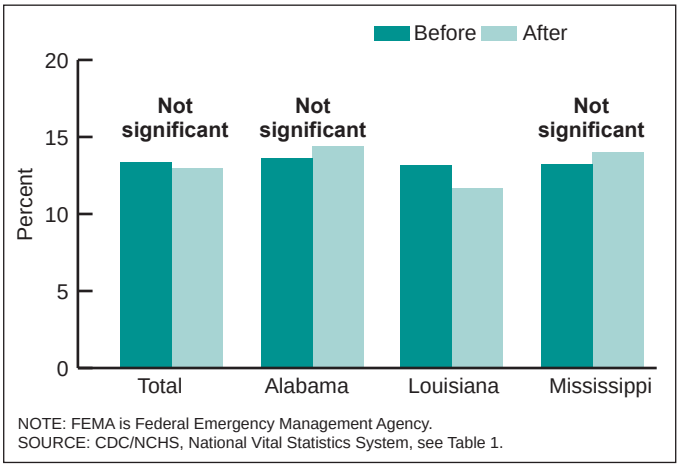
Age of mother

Levels of childbearing by age of mother are best measured using population-based birth rates, that is, birth rates based on the female population. However, it is not possible to compute these rates reliably for the Katrina-impacted areas with the information currently available. Consequently, this section looks at the proportion of births in the Katrina-affected areas to teenagers and older mothers before and after the hurricane. This information can be used to examine changes in the age distribution of women giving birth.

In the 14 selected FEMA-designated counties and parishes, the percentage of teenage births changed only in the selected parishes of Louisiana (the area most affected), declining 11 percent, from 13.6 to 12.1 percent (Table 1 and Figures 7 and 8). This decline in births reflects, in part, the decline in the number of younger people in the FEMA-designated parishes of Louisiana after the storm (3). None of the changes in the area for race and Hispanic origin groups was significant. Some compensating changes occurred for women aged 20 years and older. Among non-Hispanic white women in the selected parishes of Louisiana, the proportion of births to women aged 20–29 years increased 4 percent after the storm but decreased significantly for women aged 30 years and older (5 percent). For the 14 selected counties and parishes overall, the percentage of births to women aged 30 years and older declined 3 percent for non-Hispanic white and 13 percent for Hispanic women.

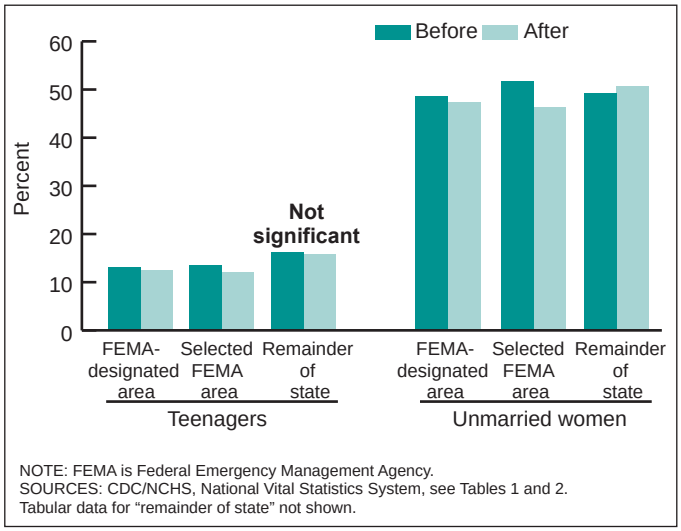
Few significant changes occurred in the proportion of births to women under age 20 years in the 12-month period after Hurricane Katrina compared with before the storm in the total 91 FEMA-designated counties and parishes (Table 2).

For the remaining portion of the states not in the 91 FEMA-designated counties and parishes, the percentage of teenage births increased only for non-Hispanic black women in Alabama, by 5 percent (tabular data not shown). However, changes in the proportions for women aged 20 years and older for population subgroups and states overall varied considerably for the remaining portion of the states.



NOTE: FEMA is Federal Emergency Management Agency.
SOURCE: CDC/NCHS, National Vital Statistics System, see Table 1.

Figure 7. Percentage of births to teenagers: 14 selected FEMA-designated counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)



NOTE: FEMA is Federal Emergency Management Agency.
SOURCES: CDC/NCHS, National Vital Statistics System, see Tables 1 and 2.
Tabular data for "remainder of state" not shown.

Figure 8. Percentage of births to teenagers and unmarried women: Total FEMA-designated, selected FEMA-designated, and remaining parishes of Louisiana, 12-month periods before and after Hurricane Katrina (August 29, 2005)

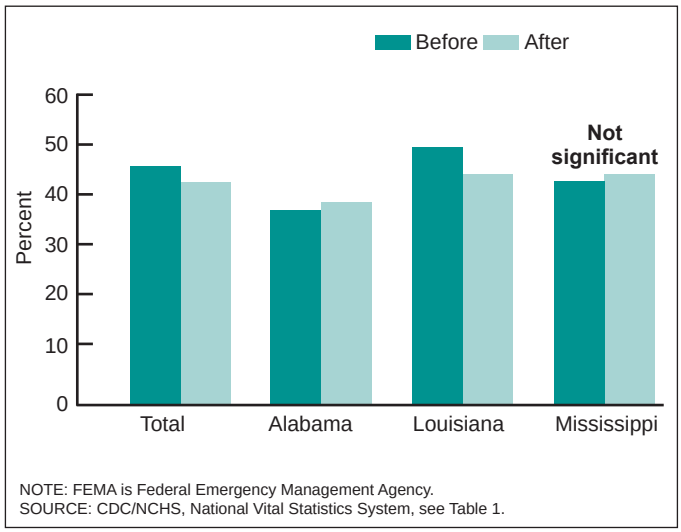
Births to unmarried women

Childbearing by unmarried women is associated with elevated risks for the mother and child. Unmarried women are less likely to receive timely prenatal care, more likely to smoke during pregnancy, and less likely to gain adequate weight during pregnancy, and their infants are more likely to be of low birthweight, to be preterm, and to die before their first birthday (15,26,27). While at one time unmarried mothers were disproportionately teenagers, this is no longer the case. In 2006, 23 percent of nonmarital births were to teenagers (16). The relatively large decreases in teenage and nonmarital childbearing in the selected FEMA-designated parishes of Louisiana (Figure 8) and the comparatively stable levels of nonmarital births in the selected counties of Mississippi may be linked to changes in the population composition previously described (Table 1) (see "Births by county or parish").

The proportion of births to unmarried women has been increasing steadily among all population groups in recent years in the United States, reaching 38.5 percent in 2006 (16). The 14 selected counties or parishes show an overall *decline* of 6 percent in the proportion of nonmarital births, from 47.8 percent to 44.7 percent (Table 1 and Figure 9). The percentage of births to unmarried women declined by 10 percent in the selected parishes of Louisiana, from 51.7 percent to 46.3 percent. In Mississippi, by contrast, no significant change occurred for the selected counties of the state. Some unmarried women living in Katrina-impacted areas may have relocated to other parts of Louisiana or to Mississippi, where the proportions of births to unmarried women increased 3–4 percent (Table 2; see "Conclusion").

Educational attainment

Maternal education has long been considered an important factor in fertility and maternal and infant health. Women with higher educational attainment are more likely to desire and give birth to fewer children, and are less likely to engage in behaviors detrimental to health and pregnancy (28–30).



NOTE: FEMA is Federal Emergency Management Agency.
SOURCE: CDC/NCHS, National Vital Statistics System, see Table 1.

Figure 9. Percentage of births to unmarried women: 14 selected FEMA-designated counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)

The level of educational attainment of women giving birth has increased substantially over the last few decades in the United States (31). In the 14 selected FEMA-designated counties and parishes, the percentage of women who had completed at least 12 or more years of school at the time they gave birth was 2 percent higher after the hurricane than the percentage of women who gave birth before the storm struck (Table 1). This rise in educational attainment was to some extent unexpected, given the substantial population decline following the storm. More surprisingly, the percentage of women giving birth who completed 16 or more years of school (roughly equivalent to a bachelor's degree or higher) rose even higher, by 12 percent, in the 12 months after the hurricane. These increases were generally centered in the selected parishes of Louisiana. In the total 91 FEMA-designated counties and parishes, the percentage of college-educated women giving birth rose 3 percent, with these increases concentrated in FEMA-designated counties and parishes of Alabama and Louisiana (Table 2). However, the level of educational attainment of mothers in Mississippi declined after the storm. These changes reflect, in part, the population changes within Katrina-impacted areas, that is, the loss of the diasporic population and the addition of new immigrants to the areas; see "Conclusion" (3,5).

Most of the notable changes in educational attainment among population groups were reported for non-Hispanic black and Hispanic women. The percentage of non-Hispanic black women giving birth who completed at least 12 years of school increased 4 percent in the 14 selected counties and parishes of the three states combined, whereas the percentage of college-educated women increased 11 percent overall, rising 15 percent in the selected parishes of Louisiana. The percentage of Hispanic women who completed at least 12 years of school, by contrast, decreased 8 percent for the 14 selected counties and parishes, and the percentage reporting at least 16 years of school decreased substantially, by 30 percent. This last decrease was concentrated in the selected parishes of Louisiana, where the level of advanced education for Hispanic women giving birth fell from 21.6 percent to 16.0 percent, which could reflect, in part, the influx of Hispanic immigrants into the area (4). Changes in the level of educational attainment of mothers by race and Hispanic origin in the total 91 FEMA-designated counties and parishes were generally similar to the changes for those groups in the selected counties and parishes.

Health characteristics

Medical care utilization

The impact of Hurricane Katrina was especially severe on the availability of health care services. In the aftermath of the hurricane, many hospitals and medical centers, particularly in the New Orleans Metropolitan Area, closed their doors at least temporarily, leaving thousands of pregnant women without access to prenatal care and related services (32). Furthermore, this disruption in medical services meant the potential loss of medical records, possibly affecting, for example, information on when prenatal care began. This section describes some of the impact as reflected in receipt of prenatal care and method of delivery.

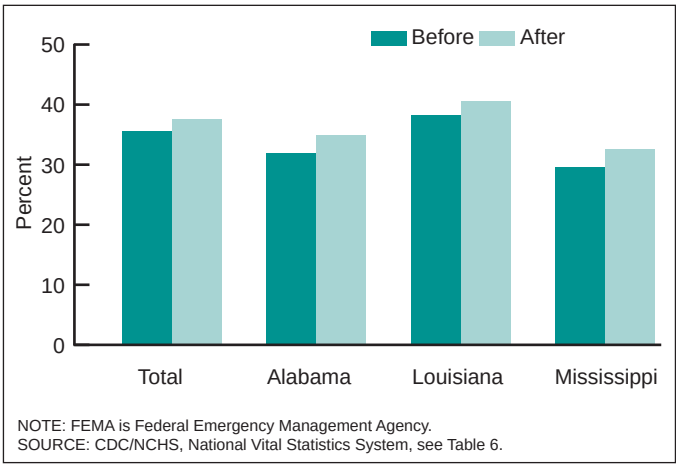
Prenatal care—Access to and use of prenatal care can be viewed as an important indicator of the quality of public health, because early and ongoing prenatal care may enhance pregnancy outcome and maternal and infant health—by assessing risk, providing health care advice, and managing chronic and pregnancy-related health conditions (16).

There are a few notable changes in late prenatal care (beginning in the third trimester) or no prenatal care for the selected 14 FEMA-designated counties and parishes for the 12 months following Hurricane Katrina from the preceding 12 months (Table 6). Both Alabama and Mississippi had relatively large increases in late or no prenatal care, from 2.2 percent to 2.7 percent for Alabama and from 2.3 percent to 3.3 percent for Mississippi. Late or no care among non-Hispanic white women increased from 1.4 percent to 1.8 percent for the total 14 selected counties and parishes, and from 1.3 percent to 1.8 percent for the selected counties in Alabama. For non-Hispanic black women in Mississippi, late or no care increased from 3.2 percent to 5.0 percent, and it increased for Hispanic women in Louisiana, from 2.3 percent to 3.9 percent.

Most of the changes in both percentages, of those beginning prenatal care in the first trimester and those receiving late or no care, were small (or not significant) for the total FEMA-designated area (all 91 counties and parishes; see Table 7). Nevertheless, Hispanic women in the Louisiana parishes had a significant increase (from 3.0 percent to 4.7 percent) in late or no prenatal care.

Cesarean delivery—The availability of hospital obstetric facilities declined sharply in the wake of Hurricane Katrina. Women giving birth after Katrina were served by fewer hospitals and medical centers, particularly in the New Orleans Metropolitan Area (32). Yet surprisingly, the cesarean delivery rate increased.

The cesarean delivery rate for the total selected FEMA-designated area, including both planned and unplanned cesarean deliveries, rose 6 percent in the 12-month period after Hurricane Katrina from the 12-month period before the storm, with increases of 10 percent in Alabama and Mississippi and 6 percent in Louisiana (Table 6 and Figure 10). By comparison, the level of and change in cesarean deliveries for these areas were generally higher than in the United States for 2004–2006. Changes in cesarean delivery rates for race and Hispanic origin groups were generally similar, although rates for



NOTE: FEMA is Federal Emergency Management Agency.
SOURCE: CDC/NCHS, National Vital Statistics System, see Table 6.

Figure 10. Percentage of births by cesarean delivery: 14 selected FEMA-designated counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)

Hispanic women were essentially unchanged. Cesarean delivery compared with vaginal delivery is associated with an increased risk of respiratory problems for infants, greater complications in subsequent pregnancies, and longer maternal hospital stays (33).

Infant characteristics or birth outcomes

A disaster of the unprecedented magnitude of Hurricane Katrina might be expected to impose great emotional and physical stress and hardship on the affected population, especially pregnant women.

The incidence of preterm and low birthweight in a community can be viewed as an important indicator of public health. (Preterm is defined as less than 37 completed weeks of gestation, and low birthweight, as less than 2,500 grams.) Infants born preterm or of low birthweight are at greater risk of early death and lifelong health and developmental problems than those born at term (37–42 weeks); the shorter the gestation and lower the birthweight, the greater the risk (15).

Period of gestation and birthweight—Surprisingly, large *declines* in levels of very preterm (from 3.2 percent to 2.4 percent) and very low birthweight (from 2.3 percent to 1.8 percent) births occurred for the 14 selected coastal counties and parishes of Louisiana in the 12-month period following Hurricane Katrina compared with the preceding 12 months (Table 6). (Very preterm is defined as less than 32 completed weeks of gestation, and very low birthweight, as less than 1,500 grams.) Declines in very preterm and very low birthweight births in the most affected areas of Louisiana were concentrated among births to non-Hispanic black mothers.

In contrast to the decline in at-risk births in the hardest hit area of Louisiana, a large *rise* in very preterm births was reported for the most affected area of Alabama (from 3.1 percent to 3.8 percent) for the same time period. Very low birthweight, total low birthweight, and total preterm rates generally trended upward as well in the selected area of Alabama after the hurricane, but differences by 12-month period were not significant. Increases in poor birth outcome were observed among births to both non-Hispanic white and non-Hispanic black mothers in this selected area of Alabama.

Large increases in very preterm, total preterm, and very low birthweight births were also observed for the total designated area of Alabama in the 12 months following the hurricane from the 12 months before (Table 7). Nonsignificant increases remained for the total designated area of Alabama when the selected area was excluded (tabular data not shown); that is, birth outcomes, as measured by the percentage of newborns born too early or too small, appear to have worsened for the entire designated area of Alabama following the storm.

The marked decline in very low birthweight and very preterm births in the area of Louisiana most strongly affected by Hurricane Katrina, *plus* the large *increases* in these measures in the total designated area of Alabama, may suggest a relocation of the population of women at higher risk of poor birth outcome to areas outside of the selected counties of Louisiana; see "Conclusion" (3,5).

In Mississippi, no clear pattern in preterm or low birthweight rates was evident for either the selected or total FEMA-designated areas of the state as the result of Hurricane Katrina.

Conclusion

This report compares birth data for the FEMA-designated counties and parishes of the Hurricane Katrina disaster for 12-month periods before and after the storm to provide a demographic and public health description of the changes in the characteristics of women giving birth and their infants. Comparisons of demographic characteristics before and after Hurricane Katrina show a number of striking differences for specific areas and race and Hispanic origin groups. For the 14 selected counties and parishes that represent the area hit very hard by the storm and subsequent flooding, for example, the number of births was considerably lower after the storm, especially in the selected parishes in Louisiana. Births for most race and Hispanic origin groups were lower for the selected area, again with the largest declines in Louisiana, particularly for non-Hispanic black women. Comparisons of health outcomes, however, were generally less conclusive. For example, very preterm rates were lower for the selected parishes of Louisiana in the 12-month period following Hurricane Katrina but were higher for the selected counties of Alabama and essentially unchanged for the selected counties of Mississippi.

It is necessary to note in this report two limitations in assessing the effects of Hurricane Katrina on fertility patterns and birth outcomes. First, Hurricane Katrina was not the only severe storm to strike in the Gulf of Mexico from 2004 to 2006. The 2005 Atlantic hurricane season included several major storms, with one, Hurricane Rita, passing through the regions where many of those displaced from Hurricane Katrina had relocated, less than a month after the disaster (September 24, 2005) (2). Some of the findings in this report may reflect, in part, the impact of Hurricane Katrina in combination with these other severe storms.

Second, birth certificate data on which this report is based cannot separate the new arrivals, that is, immigrants to the area, from the returning population, or identify the population that did not relocate during this period. Moreover, data are not available to monitor those women who permanently relocated elsewhere. U.S. Census Bureau analyses suggest that the demographic composition of the region changed following Hurricane Katrina. For example, the number of younger people and African Americans in the FEMA-designated parishes of Louisiana declined substantially, whereas a large number of Hispanic immigrants moved in to the area (3,4). Some women who left

the New Orleans area may have relocated to other parts of Louisiana or to Alabama or Mississippi, thus affecting the statistical portrait of the childbearing population in these areas. Still others left the Southeast United States altogether. The departure of women at relatively higher or lower risk of poor birth outcomes could affect key measures of these outcomes. Some of the findings in this report may reflect, in part, these population shifts experienced in the Hurricane Katrina-impacted region.

This report adds new information to the existing research on the impact of Hurricane Katrina through the detailed comparisons of birth statistics before and after the disaster. In addition to evaluating the effect of Hurricane Katrina on birth statistics, this report also provides a base for monitoring the patterns and emerging trends in the vital statistics and health status of infants and pregnant women as the region recovers. It is particularly important to monitor the patterns and trends in birth outcomes as low birthweight and preterm births are predictors of infant mortality and morbidity.

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List of Detailed Tables

Table 1. Total number of births and percentage of births with selected demographic characteristics, by race and Hispanic origin and area of residence of mother, and statistically significant percent change: 14 selected Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)

Births and characteristics and race and Hispanic origin of mother	Total area[1]			Alabama[2]			Louisiana[2]			Mississippi[2]		
	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change
Total number of births[5]	34,520	27,848	–19	7,839	8,289	6	21,361	14,932	–30	5,320	4,627	–13
Non-Hispanic white	18,706	17,020	–9	4,831	5,093	†	10,203	8,808	–14	3,672	3,119	–15
Non-Hispanic black	13,170	8,478	–36	2,576	2,728	†	9,296	4,575	–51	1,298	1,175	†
American Indian or Alaska Native total[6]	277	287	†	31	39	†	225	229	†	21	19	*
Asian or Pacific Islander total[6]	880	647	–26	150	142	†	567	377	–34	163	128	†
Hispanic[7]	1,478	1,309	–11	242	280	†	1,079	851	–21	157	178	†
Selected demographic characteristics												
All races and origins[8]												
Births to mothers by age												
Less than 20 years	13.8	13.4	†	14.1	14.9	†	13.6	12.1	–11	13.7	14.5	†
20–29 years	58.0	57.9	†	58.3	58.1	†	57.0	57.1	†	61.7	60.5	†
30 years or more	28.3	28.7	†	27.6	27.0	†	29.4	30.8	5	24.5	25.0	†
Births to unmarried mothers	47.8	44.7	–6	39.1	40.7	4	51.7	46.3	–10	44.8	46.3	†
Educational attainment of mother												
12 or more years of school	77.2	78.9	2	76.8	77.8	†	77.4	80.4	4	77.5	76.2	†
16 or more years of school	21.4	23.9	12	20.9	22.4	7	22.7	26.6	17	16.9	17.9	†
Non-Hispanic white												
Births to mothers by age												
Less than 20 years	10.1	10.2	†	10.6	11.4	†	9.0	8.5	†	12.2	13.0	†
20–29 years	55.4	56.4	†	56.3	56.5	†	52.8	55.1	4	61.4	59.9	†
30 years or more	34.6	33.4	–3	33.1	32.0	†	38.2	36.4	–5	26.4	27.1	†
Births to unmarried mothers	29.8	30.5	†	23.4	24.5	†	30.9	32.0	†	34.9	36.2	†
Educational attainment of mother												
12 or more years of school	82.3	83.0	†	81.1	81.3	†	84.0	85.8	2	79.1	78.0	†
16 or more years of school	29.7	31.3	5	27.8	29.6	6	34.0	35.5	4	20.5	22.2	†
Non-Hispanic black												
Births to mothers by age												
Less than 20 years	19.7	20.3	†	21.0	21.6	†	19.4	19.3	†	19.0	20.7	†
20–29 years	62.7	61.6	†	62.2	61.0	†	62.5	61.9	†	64.6	62.1	†
30 years or more	17.7	18.1	†	16.8	17.4	†	18.1	18.8	†	16.3	17.2	†
Births to unmarried mothers	75.9	74.4	–2	70.8	73.1	†	77.4	74.8	–3	75.1	75.5	†
Educational attainment of mother												
12 or more years of school	70.9	73.4	4	71.2	74.4	4	70.5	73.0	4	73.4	72.7	†
16 or more years of school	9.4	10.4	11	8.4	9.7	†	10.0	11.5	15	6.9	8.2	†

See footnotes at end of table.

Table 1. Total number of births and percentage of births with selected demographic characteristics, by race and Hispanic origin and area of residence of mother, and statistically significant percent change: 14 selected Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)—Con.

Births and characteristics and race and Hispanic origin of mother	Total area[1]			Alabama[2]			Louisiana[2]			Mississippi[2]		
	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change
Selected demographic characteristics—Con.												
Hispanic[7]												
Births to mothers by age												
Less than 20 years	11.6	13.0	†	14.9	18.2	†	10.8	11.8	†	12.7	*	. . .
20–29 years	55.8	58.6	†	58.7	59.3	†	54.9	56.9	†	58.0	65.7	†
30 years or more	32.5	28.4	–13	26.4	22.5	†	34.4	31.4	†	29.3	23.6	†
Births to unmarried mothers	40.3	43.9	†	25.2	29.3	†	43.0	48.1	12	45.2	46.6	†
Educational attainment of mother												
12 or more years of school	69.7	64.1	–8	50.2	46.7	†	73.5	70.1	†	72.8	63.4	†
16 or more years of school	19.2	13.5	–30	12.2	9.3	†	21.6	16.0	–26	*	*	. . .

* Figure does not meet standards of reliability or precision; based on fewer than 20 births or, for percentages, fewer than 20 births in the numerator.

† Difference not statistically significant.

. . . Category not applicable.

[1]Selected areas are 14 FEMA-designated assistance, coastal counties or parishes within a 100-mile radius of the Hurricane Katrina storm path: Baldwin and Mobile counties in Alabama; Iberia, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Mary, St. Tammany, and Terrebonne parishes in Louisiana; and Hancock, Harrison, and Jackson counties in Mississippi.

[2]Figures for each state are based on the sum of births by selected FEMA-designated county or parish of residence for the state.

[3]The 12-month period before Hurricane Katrina: August 29, 2004–August 28, 2005.

[4]The 12-month period after Hurricane Katrina: August 29, 2005–August 28, 2006.

[5]Includes origin not stated.

[6]Data for all persons of Hispanic origin are included in the data for each race group according to the mother's reported race; see "Technical Notes."

[7]Includes all persons of Hispanic origin of any race; see "Technical Notes."

[8]Includes races other than white and black and origin not stated.

Table 2. Total number of births and percentage of births with selected demographic characteristics, by race and Hispanic origin and area of residence of mother, and statistically significant percent change: 91 Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month period before and after Hurricane Katrina (August 29, 2005)

Births and characteristics and race and Hispanic origin of mother	Total area[1]			Alabama[2]			Louisiana[2]			Mississippi[2]		
	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change
Total number of births[5]	85,223	81,452	–4	11,776	12,246	4	44,495	39,292	–12	28,952	29,914	3
Non-Hispanic white	45,683	44,328	–3	6,879	7,043	†	23,922	22,655	–5	14,882	14,630	†
Non-Hispanic black	34,662	32,258	–7	4,286	4,533	†	17,735	14,058	–21	12,641	13,667	8
American Indian or Alaska Native total[6]	617	675	†	60	63	†	269	299	†	288	313	†
Asian or Pacific Islander total[6]	1,469	1,237	–16	195	192	†	909	729	–20	365	316	†
Hispanic[7]	2,721	2,815	†	345	409	†	1,620	1,439	–11	756	967	28
Selected demographic characteristics												
All races and origins[8]												
Births to mothers by age												
Less than 20 years	13.9	13.9	†	13.8	14.2	†	13.2	12.6	–5	14.9	15.6	5
20–29 years	59.6	60.3	1	58.7	59.3	†	59.0	59.7	1	60.9	61.6	†
30 years or more	26.5	25.7	–3	27.5	26.4	†	27.7	27.7	†	24.2	22.8	–6
Births to unmarried mothers	47.4	48.1	1	40.0	41.2	†	48.6	47.4	–2	48.6	51.8	7
Educational attainment of mother												
12 or more years of school	78.2	78.9	1	78.2	79.3	1	78.6	80.7	3	77.5	76.4	–1
16 or more years of school	22.0	22.7	3	21.1	22.4	6	23.3	25.3	9	20.3	19.6	–3
Non-Hispanic white												
Births to mothers by age												
Less than 20 years	9.8	10.2	4	9.9	10.5	†	9.3	8.9	†	10.6	11.9	12
20–29 years	57.8	58.6	1	56.7	57.7	†	56.6	58.2	3	60.1	59.7	†
30 years or more	32.4	31.2	–4	33.4	31.7	–5	34.0	32.9	–3	29.3	28.4	†
Births to unmarried mothers	27.3	28.4	4	21.5	22.5	†	30.0	30.9	3	25.5	27.4	7
Educational attainment of mother												
12 or more years of school	83.5	84.2	1	82.6	83.1	†	84.6	86.3	2	82.3	81.7	†
16 or more years of school	30.8	31.5	2	29.1	30.6	†	32.5	33.8	4	28.7	28.4	†
Non-Hispanic black												
Births to mothers by age												
Less than 20 years	19.6	19.4	†	20.1	20.0	†	19.0	18.9	†	20.1	19.8	†
20–29 years	62.7	63.2	†	62.3	62.0	†	63.3	63.1	†	62.0	63.6	3
30 years or more	17.7	17.4	†	17.6	18.0	†	17.6	18.0	†	17.8	16.6	–7
Births to unmarried mothers	75.3	75.7	†	71.4	72.1	†	75.8	75.0	†	75.9	77.6	2
Educational attainment of mother												
12 or more years of school	72.5	73.9	2	73.6	75.9	3	71.5	73.5	3	73.7	73.7	†
16 or more years of school	10.4	11.3	9	8.5	10.2	20	10.6	11.8	11	10.9	11.1	†

See footnotes at end of table.

Table 2. Total number of births and percentage of births with selected demographic characteristics, by race and Hispanic origin and area of residence of mother, and statistically significant percent change: 91 Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month period before and after Hurricane Katrina (August 29, 2005)—Con.

Births and characteristics and race and Hispanic origin of mother	Total area[1]			Alabama[2]			Louisiana[2]			Mississippi[2]		
	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change
Selected demographic characteristics—Con.												
Hispanic[7]												
Births to mothers by age												
Less than 20 years	12.7	14.0	†	16.8	17.8	†	10.6	11.6	†	15.3	15.9	†
20–29 years	57.8	59.5	†	56.8	61.4	†	55.6	56.6	†	63.1	62.9	†
30 years or more	29.4	26.5	–10	26.4	20.8	†	33.8	31.8	†	21.6	21.2	†
Births to unmarried mothers	44.2	49.0	11	28.1	31.3	†	42.5	47.7	12	55.2	58.4	†
Educational attainment of mother												
12 or more years of school	60.3	53.9	–11	47.6	46.5	†	69.0	66.8	†	46.5	37.3	–20
16 or more years of school	15.7	12.3	–22	10.8	9.9	†	20.2	17.3	–14	7.6	5.7	†

† Difference not statistically significant.

[1]The 91 FEMA-designated assistance areas of Alabama, Louisiana, and Mississippi impacted by Hurricane Katrina are: in Alabama—Baldwin, Choctaw, Clarke, Greene, Hale, Marengo, Mobile, Pickens, Sumter, Tuscaloosa, and Washington counties; in Louisiana—the parishes of Acadia, Ascension, Assumption, Calcasieu, Cameron, East Baton Rouge, East Feliciana, Iberia, Iberville, Jefferson, Jefferson Davis, Lafayette, Lafourche, Livingston, Orleans, Plaquemines, Pointe Coupee, St. Bernard, St. Charles, St. Helena, St. James, St. John the Baptist, St. Martin, St. Mary, St. Tammany, Tangipahoa, Terrebonne, Vermilion, Washington, West Baton Rouge, and West Feliciana counties; and in Mississippi—Adams, Amite, Attala, Choctaw, Claiborne, Clarke, Copiah, Covington, Forrest, Franklin, George, Greene, Hancock, Harrison, Hinds, Holmes, Humphreys, Jackson, Jasper, Jefferson, Jefferson Davis, Jones, Kemper, Lamar, Lauderdale, Lawrence, Leake, Lincoln, Lowndes, Madison, Marion, Neshoba, Newton, Noxubee, Oktibbeha, Pearl River, Perry, Pike, Rankin, Scott, Simpson, Smith, Stone, Walthall, Warren, Wayne, Wilkinson, Winston, and Yazoo counties.

[2]Figures for each state are based on the sum of births by FEMA-designated county or parish of residence for the state.

[3]The 12-month period before Hurricane Katrina: August 29, 2004–August 28, 2005.

[4]The 12-month period after Hurricane Katrina: August 29, 2005–August 28, 2006.

[5]Includes origin not stated.

[6]Data for all persons of Hispanic origin are included in the data for each race group according to the mother's reported race; see "Technical Notes."

[7]Includes all persons of Hispanic origin of any race; see "Technical Notes."

[8]Includes races other than white and black and origin not stated.

Table 3. Number of births, by county of residence and statistically significant percent change: 91 Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)

[Small figures should be intrepreted with caution]

Area	12-month period before Hurricane Katrina[1]	12-month period after Hurricane Katrina[2]	Percent change
Total number of births[3]	85,223	81,452	–4
Alabama[3]	11,776	12,246	4
Baldwin County	2,062	2,218	†
Choctaw County	170	175	†
Clarke County	335	312	†
Greene County	111	124	†
Hale County	239	192	†
Marengo County	279	272	†
Mobile County	5,777	6,071	†
Pickens County	228	227	†
Sumter County	137	169	†
Tuscaloosa County	2,239	2,288	†
Washington County	199	198	†
Louisiana[3]	44,495	39,292	–12
Acadia Parish	958	903	†
Ascension Parish	1,486	1,666	12
Assumption Parish	287	255	†
Calcasieu Parish	2,719	2,723	†
Cameron Parish	85	65	†
East Baton Rouge Parish	5,572	6,124	10
East Feliciana Parish	259	270	†
Iberia Parish	1,100	1,135	†
Iberville Parish	475	449	†
Jefferson Parish	6,115	4,997	–18
Jefferson Davis Parish	425	481	†
Lafayette Parish	2,911	3,085	†
Lafourche Parish	1,146	1,162	†
Livingston Parish	1,665	1,755	†
Orleans Parish	6,518	2,025	–69
Plaquemines Parish	389	230	–41
Pointe Coupee Parish	291	306	†
St. Bernard Parish	822	152	–82
St. Charles Parish	674	685	†
St. Helena Parish	99	119	†
St. James Parish	329	291	†
St. John the Baptist Parish	686	766	†
St. Martin Parish	779	759	†
St. Mary Parish	782	758	†
St. Tammany Parish	2,853	2,805	†
Tangipahoa Parish	1,606	1,786	11
Terrebonne Parish	1,636	1,668	†
Vermilion Parish	824	781	†
Washington Parish	579	645	†
West Baton Rouge Parish	316	330	†
West Feliciana Parish	109	116	†
Mississippi[3]	28,952	29,914	3
Adams County	427	448	†
Amite County	156	164	†
Attala County	299	305	†
Choctaw County	103	106	†
Claiborne County	145	146	†
Clarke County	221	246	†
Copiah County	443	524	†
Covington County	318	306	†
Forrest County	1,087	1,216	†
Franklin County	102	107	†
George County	329	334	†
Greene County	147	164	†
Hancock County	536	411	–23
Harrison County	2,998	2,454	–18
Hinds County	3,953	4,080	†
Holmes County	382	432	†
Humphreys County	189	222	†

See footnotes at end of table.

Table 3. Number of births, by county of residence and statistically significant percent change: 91 Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)—Con.

[Small figures should be intrepreted with caution]

Area	12-month period before Hurricane Katrina[1]	12-month period after Hurricane Katrina[2]	Percent change
Jackson County	1,786	1,762	†
Jasper County	232	245	†
Jefferson County	130	125	†
Jefferson Davis County	155	219	41
Jones County	1,019	1,130	†
Kemper County	104	141	†
Lamar County	707	755	†
Lauderdale County	1,163	1,188	†
Lawrence County	176	168	†
Leake County	361	403	†
Lincoln County	465	515	†
Lowndes County	813	932	15
Madison County	1,211	1,400	16
Marion County	380	401	†
Neshoba County	508	551	†
Newton County	366	344	†
Noxubee County	202	198	†
Oktibbeha County	612	564	†
Pearl River County	656	759	†
Perry County	169	162	†
Pike County	632	691	†
Rankin County	1,951	2,010	†
Scott County	505	509	†
Simpson County	403	423	†
Smith County	206	218	†
Stone County	161	201	†
Walthall County	189	246	†
Warren County	756	763	†
Wayne County	250	374	50
Wilkinson County	133	134	†
Winston County	289	258	†
Yazoo County	427	460	†

† Difference not statistically significant.

[1]The 12-month period before Hurricane Katrina: August 29, 2004–August 28, 2005.

[2]The 12-month period after Hurricane Katrina: August 29, 2005–August 28, 2006.

[3]Total births for area are the sum of births by FEMA-designated county or parish of residence for the area.

Table 4. Number of births, by month of birth, race and Hispanic origin and area of residence of mother, and statistically significant percent change: 14 selected Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)

Months	Total area[1]			Alabama[2]			Louisiana[2]			Mississippi[2]		
	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change
All races and origins[5,6]	34,520	27,848	–19	7,839	8,289	6	21,361	14,932	–30	5,320	4,627	–13
September	3,113	2,288	–27	705	713	†	1,945	1,213	–38	463	362	–22
October	3,111	2,177	–30	625	695	†	2,004	1,104	–45	482	378	–22
November	3,000	2,134	–29	669	688	†	1,867	1,089	–42	464	357	–23
December	3,056	2,204	–28	691	712	†	1,903	1,104	–42	462	388	†
January	2,926	2,424	–17	703	743	†	1,788	1,287	–28	435	394	†
February	2,615	2,112	–19	581	646	†	1,631	1,103	–32	403	363	†
March	2,928	2,375	–19	638	679	†	1,847	1,303	–29	443	393	†
April	2,602	2,105	–19	596	620	†	1,633	1,143	–30	373	342	†
May	2,751	2,239	–19	637	657	†	1,715	1,218	–29	399	364	†
June	2,848	2,334	–18	649	616	†	1,752	1,322	–25	447	396	†
July	2,806	2,608	†	642	717	†	1,709	1,456	–15	455	435	†
August[7]	2,446	2,629	†	628	742	18	1,376	1,462	†	442	425	†
Non-Hispanic white[5]	18,706	17,020	–9	4,831	5,093	†	10,203	8,808	–14	3,672	3,119	–15
September	1,662	1,407	–15	442	431	†	909	727	–20	311	249	†
October	1,644	1,284	–22	368	404	†	944	646	–32	332	234	–30
November	1,554	1,270	–18	380	399	†	864	640	–26	310	231	–25
December	1,619	1,392	–14	415	442	†	893	683	–24	311	267	†
January	1,540	1,460	†	420	441	†	809	757	†	311	262	†
February	1,458	1,329	†	357	420	†	816	661	–19	285	248	†
March	1,610	1,514	†	416	419	†	888	833	†	306	262	†
April	1,447	1,301	–10	361	396	†	807	664	–18	279	241	†
May	1,504	1,397	†	410	404	†	814	739	†	280	254	†
June	1,606	1,461	†	412	407	†	882	781	†	312	273	†
July	1,501	1,546	†	399	443	†	803	804	†	299	299	†
August[7]	1,391	1,516	†	409	440	†	682	798	17	300	278	†
Non-Hispanic black[5]	13,170	8,478	–36	2,576	2,728	†	9,296	4,575	–51	1,298	1,175	†
September	1,199	732	–39	232	247	†	856	397	–54	111	88	†
October	1,228	735	–40	224	253	†	886	362	–59	118	120	†
November	1,216	672	–45	247	250	†	845	317	–62	124	105	†
December	1,208	642	–47	235	228		850	317	–63	123	97	†
January	1,174	772	–34	251	260	†	829	407	–51	94	105	†
February	954	617	–35	190	193	†	673	332	–51	91	92	†
March	1,110	704	–37	189	225	†	816	377	–54	105	102	†
April	971	618	–36	212	189	†	686	352	–49	73	77	†
May	1,021	643	–37	191	210	†	735	344	–53	95	89	†
June	1,024	617	–40	201	171	†	716	363	–49	107	83	†
July	1,076	825	–23	194	233	†	755	489	–35	127	103	†
August[7]	869	839	†	181	255	41	568	477	–16	120	107	†

See footnotes at end of table.

Table 4. Number of births, by month of birth, race and Hispanic origin and area of residence of mother, and statistically significant percent change: 14 selected Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)—Con.

Months	Total area[1]			Alabama[2]			Louisiana[2]			Mississippi[2]		
	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change
Hispanic[5,8]	1,478	1,309	–11	242	280	†	1,079	851	–21	157	178	†
September	144	69	–52	22	21	†	110	36	–67	12	12	*
October	131	82	–37	14	21	*	106	51	–52	11	10	*
November	128	113	†	25	24	†	89	78	†	14	11	*
December	127	98	†	26	26	†	88	61	†	13	11	*
January	114	108	†	12	18	*	90	74	†	12	16	*
February	107	101	†	15	23	*	80	67	†	12	11	*
March	109	85	†	23	24	†	67	47	†	19	14	*
April	92	101	†	14	20	*	70	69	†	8	12	*
May	134	101	†	15	22	*	107	66	–38	12	13	*
June	125	145	†	20	22	†	90	99	†	15	24	*
July	138	128	†	30	25	†	93	86	†	15	17	*
August[7]	113	169	50	24	34	†	78	109	†	11	26	*

* Figure does not meet standards of reliability or precision; based on fewer than 20 births or, for percentages, fewer than 20 births in the numerator.

† Difference not statistically significant.

[1]Selected areas are 14 FEMA-designated assistance, coastal counties or parishes within a 100-mile radius of the Hurricane Katrina storm path: Baldwin and Mobile counties in Alabama; Iberia, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Mary, St. Tammany, and Terrebonne parishes in Louisiana; and Hancock, Harrison, and Jackson counties in Mississippi.

[2]Figures for each state are based on the sum of births by selected FEMA-designated county or parish of residence for the area.

[3]The 12-month period before Hurricane Katrina: August 29, 2004–August 28, 2005.

[4]The 12-month period after Hurricane Katrina: August 29, 2005–August 28, 2006.

[5]Includes births during August 29–31, 2004 or 2005.

[6]Includes races other than white and black and origin not stated.

[7]August 1–28, 2005 or 2006.

[8]Includes all persons of Hispanic origin of any race; see "Technical Notes."

Table 5. Number of births, by month of birth, race and Hispanic origin and area of residence of mother, and statistically significant percent change: 91 Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)

Months	Total area[1]			Alabama[2]			Louisiana[2]			Mississippi[2]		
	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change
All races and origins[5,6]	85,223	81,452	–4	11,776	12,246	4	44,495	39,292	–12	28,952	29,914	3
September	7,751	6,984	–10	1,040	1,052	†	4,100	3,347	–18	2,611	2,585	†
October	7,476	6,555	–12	937	1,022	†	4,047	3,068	–24	2,492	2,465	†
November	7,364	6,417	–13	1,031	997	†	3,856	3,050	–21	2,477	2,370	†
December	7,606	6,763	–11	1,050	1,041	†	3,938	3,150	–20	2,618	2,572	†
January	7,097	6,828	†	1,034	1,085	†	3,703	3,268	–12	2,360	2,475	†
February	6,399	6,197	†	912	967	†	3,368	2,906	–14	2,119	2,324	10
March	7,048	6,785	†	941	1,012	†	3,771	3,356	–11	2,336	2,417	†
April	6,425	6,122	†	890	904	†	3,364	2,962	–12	2,171	2,256	†
May	6,839	6,590	†	951	970	†	3,559	3,166	–11	2,329	2,454	†
June	7,107	6,851	†	977	967	†	3,740	3,342	–11	2,390	2,542	†
July	6,895	7,328	6	991	1,046	†	3,479	3,682	†	2,425	2,600	†
August[7]	6,480	7,376	14	918	1,071	17	3,205	3,668	14	2,357	2,637	12
Non-Hispanic white[5]	45,683	44,328	–3	6,879	7,043	†	23,922	22,655	–5	14,882	14,630	†
September	4,132	3,823	–7	622	594	†	2,194	1,964	–10	1,316	1,265	†
October	3,915	3,486	–11	522	554	†	2,142	1,752	–18	1,251	1,180	†
November	3,801	3,415	–10	558	548	†	2,020	1,749	–13	1,223	1,118	†
December	3,950	3,648	–8	594	611	†	2,042	1,805	–12	1,314	1,232	†
January	3,721	3,658	†	582	609	†	1,938	1,844	†	1,201	1,205	†
February	3,481	3,399	†	529	585	†	1,846	1,677	–9	1,106	1,137	†
March	3,925	3,856	†	586	587	†	2,072	2,041	†	1,267	1,228	†
April	3,568	3,386	†	519	541	†	1,876	1,731	†	1,173	1,114	†
May	3,718	3,703	†	578	565	†	1,902	1,874	†	1,238	1,264	†
June	3,896	3,832	†	595	585	†	2,085	1,959	†	1,216	1,288	†
July	3,634	3,905	7	577	601	†	1,816	2,046	13	1,241	1,258	†
August[7]	3,537	3,846	9	556	582	†	1,785	2,034	14	1,196	1,230	†
Non-Hispanic black[5]	34,662	32,258	–7	4,286	4,533	†	17,735	14,058	–21	12,641	13,667	8
September	3,168	2,801	–12	371	410	†	1,636	1,209	–26	1,161	1,182	†
October	3,118	2,712	–13	367	414	†	1,641	1,147	–30	1,110	1,151	†
November	3,115	2,610	–16	415	389	†	1,582	1,102	–30	1,118	1,119	†
December	3,213	2,761	–14	397	372	†	1,632	1,166	–29	1,184	1,223	†
January	2,983	2,783	†	401	421	†	1,544	1,224	–21	1,038	1,138	†
February	2,565	2,436	†	335	329	†	1,313	1,049	–20	917	1,058	15
March	2,761	2,551	–8	315	378	†	1,484	1,113	–25	962	1,060	†
April	2,493	2,339	†	335	313	†	1,268	1,003	–21	890	1,023	15
May	2,704	2,461	–9	323	342	†	1,410	1,055	–25	971	1,064	†
June	2,807	2,560	–9	332	324	†	1,418	1,119	–21	1,057	1,117	†
July	2,870	2,962	†	346	393	†	1,447	1,381	†	1,077	1,188	†
August[7]	2,577	3,030	18	310	417	35	1,222	1,367	12	1,045	1,246	19

See footnotes at end of table.

Table 5. Number of births, by month of birth, race and Hispanic origin and area of residence of mother, and statistically significant percent change: 91 Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)—Con.

Months	Total area[1]			Alabama[2]			Louisiana[2]			Mississippi[2]		
	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change
Hispanic[5,8]	2,721	2,815	†	345	409	†	1,620	1,439	–11	756	967	28
September	254	210	†	31	31	†	162	91	–44	61	88	†
October	257	186	–28	23	32	†	155	89	–43	79	65	†
November	241	228	†	29	37	†	141	113	†	71	78	†
December	235	208	†	37	36	†	137	102	†	61	70	†
January	210	224	†	22	27	†	128	119	†	60	78	†
February	187	231	†	24	34	†	118	117	†	45	80	78
March	196	206	†	29	33	†	106	100	†	61	73	†
April	184	220	†	22	26	†	110	126	†	52	68	†
May	246	236		22	31	†	145	124	†	79	81	†
June	228	275	†	29	37	†	141	149	†	58	89	†
July	238	266	†	41	34	†	138	141	†	59	91	†
August[7]	223	304	36	34	51	†	125	153	†	64	100	†

† Difference not statistically significant.

[1]The 91 FEMA-designated assistance areas of Alabama, Louisiana, and Mississippi impacted by Hurricane Katrina are: in Alabama—Baldwin, Choctaw, Clarke, Greene, Hale, Marengo, Mobile, Pickens, Sumter, Tuscaloosa, and Washington counties; in Louisiana—the parishes of Acadia, Ascension, Assumption, Calcasieu, Cameron, East Baton Rouge, East Feliciana, Iberia, Iberville, Jefferson, Jefferson Davis, Lafayette, Lafourche, Livingston, Orleans, Plaquemines, Pointe Coupee, St. Bernard, St. Charles, St. Helena, St. James, St. John the Baptist, St. Martin, St. Mary, St. Tammany, Tangipahoa, Terrebonne, Vermilion, Washington, West Baton Rouge, and West Feliciana; and in Mississippi—Adams, Amite, Attala, Choctaw, Claiborne, Clarke, Copiah, Covington, Forrest, Franklin, George, Greene, Hancock, Harrison, Hinds, Holmes, Humphreys, Jackson, Jasper, Jefferson, Jefferson Davis, Jones, Kemper, Lamar, Lauderdale, Lawrence, Leake, Lincoln, Lowndes, Madison, Marion, Neshoba, Newton, Noxubee, Oktibbeha, Pearl River, Perry, Pike, Rankin, Scott, Simpson, Smith, Stone, Walthall, Warren, Wayne, Wilkinson, Winston, and Yazoo counties.

[2]Figures for each state are based on the sum of births by FEMA-designated county or parish of residence for the area.

[3]The 12-month period before Hurricane Katrina: August 29, 2004–August 28, 2005.

[4]The 12-month period after Hurricane Katrina: August 29, 2005–August 28, 2006.

[5]Includes births during August 29–31, 2004 or 2005.

[6]Includes races other than white and black and origin not stated.

[7]August 1–28, 2005 or 2006.

[8]Includes all persons of Hispanic origin of any race; see "Technical Notes."

Table 6. Percentage of births with selected medical and health characteristics, by race and Hispanic origin and area of residence of mother, and statistically significant percent change: 14 selected Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)

Characteristics and race and Hispanic origin of mother	Total area[1]			Alabama[2]			Louisiana[2]			Mississippi[2]		
	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change
Mother												
All races and origins[5]												
Prenatal care												
Beginning in first trimester	86.2	86.7	†	86.3	86.0	†	85.8	87.7	2	87.7	84.6	–4
Late or no care[6]	2.7	2.8	†	2.2	2.7	23	2.9	2.8	†	2.3	3.3	43
Cesarean delivery	35.5	37.6	6	31.8	34.9	10	38.2	40.6	6	29.6	32.5	10
Non-Hispanic white												
Prenatal care												
Beginning in first trimester	91.1	90.8	†	90.2	90.0	†	92.1	92.6	†	89.8	87.1	–3
Late or no care[6]	1.4	1.8	29	1.3	1.8	38	1.3	1.6	†	1.8	2.4	†
Cesarean delivery	36.5	38.6	6	32.7	36.3	11	40.6	42.0	†	30.0	32.5	8
Non-Hispanic black												
Prenatal care												
Beginning in first trimester	79.1	79.6	†	80.8	80.5	†	78.2	79.0	†	82.3	79.4	†
Late or no care[6]	4.4	4.6	†	3.5	3.7	†	4.9	5.1	†	3.2	5.0	56
Cesarean delivery	34.5	36.5	6	30.7	33.4	9	36.3	39.1	8	29.2	33.6	15
Hispanic[6]												
Prenatal care												
Beginning in first trimester	83.9	77.8	–7	64.7	66.9	†	88.3	81.7	–7	83.0	76.8	†
Late or no care[6]	3.7	5.3	43	8.5	8.4	†	2.3	3.9	70	*	*	. . .
Cesarean delivery	35.0	32.7	†	28.8	24.6	†	37.3	36.2	†	28.7	28.7	†
Infant												
All races and origins[5]												
Gestational age												
Very preterm[8]	3.1	2.8	–10	3.1	3.8	23	3.2	2.4	–25	2.5	2.3	†
Preterm[9]	16.7	16.7	†	18.3	19.5	†	16.1	15.4	†	16.7	15.6	†
Birthweight												
Very low birthweight[10]	2.1	2.0	†	2.1	2.5	†	2.3	1.8	–22	1.7	1.9	†
Low birthweight[11]	11.0	10.8	†	11.3	11.5	†	11.0	10.5	†	10.5	10.5	†
Non-Hispanic white												
Gestational age												
Very preterm[8]	1.9	2.0	†	2.1	2.6	†	1.7	1.7	†	2.0	1.9	†
Preterm[9]	13.8	14.4	†	15.1	17.0	13	12.5	13.1	†	15.9	13.8	–13
Birthweight												
Very low birthweight[10]	1.4	1.5	†	1.7	1.7	†	1.4	1.3	†	1.3	1.6	†
Low birthweight[11]	8.6	8.8	†	9.1	9.4	†	8.1	8.4	†	9.2	8.7	†

See footnotes at end of table.

Table 6. Percentage of births with selected medical and health characteristics, by race and Hispanic origin and area of residence of mother, and statistically significant percent change: 14 selected Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)—Con.

Characteristics and race and Hispanic origin of mother	Total area[1]			Alabama[2]			Louisiana[2]			Mississippi[2]		
	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change
Infant—Con.												
Non-Hispanic black												
Gestational age												
Very preterm[8]	5.0	4.7	†	5.1	6.2	†	5.0	4.0	–20	4.0	3.6	†
Preterm[9]	21.5	21.9	†	25.1	25.0	†	20.8	20.5	†	20.0	20.0	†
Birthweight												
Very low birthweight[10]	3.4	3.4	†	3.1	4.2	35	3.5	3.0	†	3.1	3.2	†
Low birthweight[11]	15.1	16.0	†	15.9	16.5	†	14.9	15.5	†	15.3	16.5	†
Hispanic[6]												
Gestational age												
Very preterm[8]	2.1	1.7	†	*	*	. . .	2.5	*	. . .	*	*	. . .
Preterm[9]	13.0	13.8	†	15.0	13.9	†	12.9	12.7	†	*	19.2	. . .
Birthweight												
Very low birthweight[10]	*	*	. . .	*	*	. . .	*	*	. . .	*	*	. . .
Low birthweight[11]	7.1	5.5	†	*	*	. . .	7.4	5.9	†	*	*	. . .

* Figure does not meet standards of reliability or precision; based on fewer than 20 births in the numerator.

† Difference not statistically significant.

. . . Category not applicable.

[1]Selected areas are 14 FEMA-designated assistance, coastal counties or parishes within a 100-mile radius of the Hurricane Katrina storm path: Baldwin and Mobile counties in Alabama; Iberia, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Mary, St. Tammany, and Terrebonne parishes in Louisiana; and Hancock, Harrison, and Jackson counties in Mississippi.

[2]Figures for each state are based on the sum of births by selected FEMA-designated county or parish of residence for the state.

[3]The 12-month period before Hurricane Katrina: August 29, 2004–August 28, 2005.

[4]The 12-month period after Hurricane Katrina: August 29, 2005–August 28, 2006.

[5]Includes races other than white and black and origin not stated.

[6]Care beginning in third trimester.

[7]Includes all persons of Hispanic origin of any race; see "Technical Notes."

[8]Born prior to 32 completed weeks of gestation.

[9]Born prior to 37 completed weeks of gestation.

[10]Birthweight of less than 1,500 grams (3 lb 4 oz).

[11]Birthweight of less than 2,500 grams (5 lb 8 oz).

Table 7. Percentage of births with selected medical and health characteristics, by race and Hispanic origin and area of residence of mother, and statistically significant percent change: 91 Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)

Characteristics and race and Hispanic origin of mother	Total area[1]			Alabama[2]			Louisiana[2]			Mississippi[2]		
	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change
Mother												
All races and origins[5]												
Prenatal care												
Beginning in first trimester	86.4	86.7	†	84.2	84.5	†	87.3	88.7	2	86.0	85.0	–1
Late or no care[6]	2.6	2.6	†	3.3	3.2	†	2.5	2.5	†	2.4	2.6	†
Cesarean delivery	34.7	34.9	†	32.6	35.3	8	34.8	33.7	–3	35.4	36.3	3
Non-Hispanic white												
Prenatal care												
Beginning in first trimester	92.1	92.0	†	90.0	90.0	†	93.1	93.5	†	91.5	90.6	–1
Late or no care[6]	1.3	1.4	†	1.7	1.9	†	1.1	1.2	†	1.3	1.5	†
Cesarean delivery	35.5	35.6	†	33.4	36.2	8	35.5	34.1	–4	36.5	37.6	†
Non-Hispanic black												
Prenatal care												
Beginning in first trimester	79.3	80.2	1	76.6	78.0	†	79.6	81.6	3	79.9	79.7	†
Late or no care[6]	4.2	4.0	†	5.1	4.6	†	4.5	4.3	†	3.4	3.5	†
Cesarean delivery	34.1	34.5	†	32.0	35.0	9	34.2	33.0	–4	34.8	35.9	†
Hispanic[7]												
Prenatal care												
Beginning in first trimester	79.7	77.2	–3	62.6	63.9	†	84.2	80.7	–4	77.4	77.9	†
Late or no care[6]	4.7	6.0	28	10.7	10.9	†	3.0	4.7	57	6.1	5.8	†
Cesarean delivery	32.2	29.8	†	28.0	25.7	†	36.2	34.4	†	25.5	24.6	†
Infant												
All races and origins[5]												
Gestational age												
Very preterm[8]	3.0	3.1	†	3.3	3.9	18	2.8	2.6	†	3.3	3.5	†
Preterm[9]	16.9	17.5	4	18.1	19.3	7	15.3	15.5	†	18.9	19.4	†
Birthweight												
Very low birthweight[10]	2.1	2.3	10	2.2	2.6	18	2.1	2.0	†	2.2	2.4	†
Low birthweight[11]	11.2	11.6	4	11.5	11.9	†	10.6	10.9	†	12.0	12.5	†
Non-Hispanic white												
Gestational age												
Very preterm[8]	1.8	2.0	11	2.1	2.5	†	1.5	1.7	†	2.0	2.2	†
Preterm[9]	13.7	14.3	4	14.8	16.4	11	12.2	12.7	†	15.7	15.8	†
Birthweight												
Very low birthweight[10]	1.3	1.4	†	1.6	1.6	†	1.3	1.3	†	1.1	1.5	36
Low birthweight[11]	8.4	8.7	†	8.8	9.3	†	8.1	8.3	†	8.8	9.1	†

See footnotes at end of table.

Table 7. Percentage of births with selected medical and health characteristics, by race and Hispanic origin and area of residence of mother, and statistically significant percent change: 91 Federal Emergency Management Agency (FEMA)-designated assistance counties and parishes of Alabama, Louisiana, and Mississippi, 12-month periods before and after Hurricane Katrina (August 29, 2005)—Con.

Characteristics and race and Hispanic origin of mother	Total area[1]			Alabama[2]			Louisiana[2]			Mississippi[2]		
	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change	12-month period before Hurricane Katrina[3]	12-month period after Hurricane Katrina[4]	Percent change
Infant—Con.												
Non-Hispanic black												
Gestational age												
Very preterm[8]	4.9	4.9	†	5.3	6.4	21	4.7	4.3	†	5.0	5.1	†
Preterm[9]	21.7	22.2	†	24.1	24.5	†	19.9	20.4	†	23.4	23.4	†
Birthweight												
Very low birthweight[10]	3.4	3.6	†	3.4	4.4	29	3.3	3.3	†	3.6	3.6	†
Low birthweight[11]	15.5	16.4	6	16.2	16.9	†	14.7	15.7	7	16.4	17.0	†
Hispanic[6]												
Gestational age												
Very preterm[8]	1.9	1.8	†	*	*	. . .	2.2	1.7	†	*	*	. . .
Preterm[9]	12.3	14.6	19	14.3	15.2	†	12.7	12.6	†	10.7	17.4	63
Birthweight												
Very low birthweight[10]	1.1	1.1	†	*	*	. . .	1.4	*	. . .	*	*	. . .
Low birthweight[11]	7.1	6.0	†	7.0	*	. . .	7.0	7.0	†	7.1	5.4	†

* Figure does not meet standards of reliability or precision; based on fewer than 20 births in the numerator.

† Difference not statistically significant.

. . . Category not applicable.

[1]The 91 FEMA-designated assistance areas of Alabama, Louisiana, and Mississippi impacted by Hurricane Katrina are: in Alabama—Baldwin, Choctaw, Clarke, Greene, Hale, Marengo, Mobile, Pickens, Sumter, Tuscaloosa, and Washington counties; in Louisiana—the parishes of Acadia, Ascension, Assumption, Calcasieu, Cameron, East Baton Rouge, East Feliciana, Iberia, Iberville, Jefferson, Jefferson Davis, Lafayette, Lafourche, Livingston, Orleans, Plaquemines, Pointe Coupee, St. Bernard, St. Charles, St. Helena, St. James, St. John the Baptist, St. Martin, St. Mary, St. Tammany, Tangipahoa, Terrebonne, Vermilion, Washington, West Baton Rouge, and West Feliciana; and in Mississippi—Adams, Amite, Attala, Choctaw, Claiborne, Clarke, Copiah, Covington, Forrest, Franklin, George, Greene, Hancock, Harrison, Hinds, Holmes, Humphreys, Jackson, Jasper, Jefferson, Jefferson Davis, Jones, Kemper, Lamar, Lauderdale, Lawrence, Leake, Lincoln, Lowndes, Madison, Marion, Neshoba, Newton, Noxubee, Oktibbeha, Pearl River, Perry, Pike, Rankin, Scott, Simpson, Smith, Stone, Walthall, Warren, Wayne, Wilkinson, Winston, and Yazoo counties.

[2]Figures for each state are based on the sum of births by FEMA-designated county or parish of residence for the state.

[3]The 12-month period before Hurricane Katrina: August 29, 2004–August 28, 2005.

[4]The 12-month period after Hurricane Katrina: August 29, 2005–August 28, 2006.

[5]Includes races other than white and black and origin not stated.

[6]Care beginning in third trimester.

[7]Includes all persons of Hispanic origin of any race; see "Technical Notes."

[8]Born prior to 32 completed weeks of gestation.

[9]Born prior to 37 completed weeks of gestation.

[10]Birthweight of less than 1,500 grams (3 lb 4 oz).

[11]Birthweight of less than 2,500 grams (5 lb 8 oz).

Technical Notes

Source of data

The data shown in this report are provided to the National Center for Health Statistics through the Vital Statistics Cooperative Program. The data are based on 100 percent of the birth certificates filed in all states and the District of Columbia for 2004, 2005, and 2006 (14–16). Detailed information on reporting completeness and imputation procedures may be found elsewhere (17,34,35). In this report, only births to residents of the Federal Emergency Management Agency (FEMA)-designated area of Alabama, Louisiana, and Mississippi for the 12-month periods before and after Hurricane Katrina, which struck on August 29, 2005, are included in the tables shown.

The FEMA-designated area in this report encompasses 91 counties or parishes eligible to receive individual assistance (assistance to individuals and households) and public assistance (assistance to state and local governments and certain private nonprofit organizations for the repair or replacement of disaster-damaged facilities) based on the disaster declarations issued by FEMA (11–13). These counties or parishes are: in Alabama, Baldwin, Choctaw, Clarke, Greene, Hale, Marengo, Mobile, Pickens, Sumter, Tuscaloosa, and Washington counties; in Louisiana, Acadia, Ascension, Assumption, Calcasieu, Cameron, East Baton Rouge, East Feliciana, Iberia, Iberville, Jefferson, Jefferson Davis, Lafayette, Lafourche, Livingston, Orleans, Plaquemines, Pointe Coupee, St. Bernard, St. Charles, St. Helena, St. James, St. John the Baptist, St. Martin, St. Mary, St. Tammany, Tangipahoa, Terrebonne, Vermilion, Washington, West Baton Rouge, and West Feliciana parishes; and in Mississippi, Adams, Amite, Attala, Choctaw, Claiborne, Clarke, Copiah, Covington, Forrest, Franklin, George, Greene, Hancock, Harrison, Hinds, Holmes, Humphreys, Jackson, Jasper, Jefferson, Jefferson Davis, Jones, Kemper, Lamar, Lauderdale, Lawrence, Leake, Lincoln, Lowndes, Madison, Marion, Neshoba, Newton, Noxubee, Oktibbeha, Pearl River, Perry, Pike, Rankin, Scott, Simpson, Smith, Stone, Walthall, Warren, Wayne, Wilkinson, Winston, and Yazoo counties; see Figure 1 (11–13). Detailed data are also shown in this report for selected areas hit very hard by the storm and subsequent flooding, that is, FEMA-designated coastal counties or parishes within a 100-mile radius of the Hurricane Katrina storm path (1,2,6). These 14 counties or parishes are: Baldwin and Mobile counties in Alabama; Iberia, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Mary, St. Tammany, and Terrebonne parishes in Louisiana; and Hancock, Harrison, and Jackson counties in Mississippi (see Figure 1).

1989 and 2003 revisions of U.S. Standard Certificate of Live Birth

This report includes data on items that are collected on both the 1989 revision of the U.S. Standard Certificate of Live Birth and the 2003 revision of the U.S. Standard Certificate of Live Birth. The 2003 revision is described in detail elsewhere (24,25,36). The three hurricane-impacted states—Alabama, Louisiana, and Mississippi—had not adopted the 2003 revised birth certificate as of August 29, 2006. Nevertheless, births to residents of Alabama, Louisiana, and Mississippi that occurred in states that had adopted the 2003 U.S. Standard Certificate of Live Birth are included. Data for educational attainment and prenatal care—although collected on both the 1989 and 2003 certificates—are not considered comparable between revisions (see "Education" and "Prenatal care"). Accordingly, data on educational attainment and prenatal care from births occurring in states that had adopted the 2003 revision are excluded from all tabulations. Information for 0.2 percent of births before and 1.0 percent of births after Hurricane Katrina for the total FEMA-designated area (Alabama, Louisiana, and Mississippi) are excluded for this reason.

Age of mother

Age of mother is computed in most cases from the mother's and infant's dates of birth as reported on the birth certificate. Detailed information on age of mother may be found elsewhere (14–16).

Hispanic origin and race

Hispanic origin

Hispanic origin and race are reported separately on the birth certificate. Data shown by race, that is, American Indian or Alaska Native (AIAN) and Asian or Pacific Islander (API), include women of Hispanic or non-Hispanic origin. Data shown for Hispanic women include all women of Hispanic origin of any race. Data are shown separately for non-Hispanic women according to the race of the mother because of substantial differences in childbearing patterns between Hispanic and non-Hispanic white and black women. Data for AIAN and API births are not shown separately by Hispanic origin because the majority of these populations are non-Hispanic.

Single, multiple, and "bridged" race

The 2003 revision of the U.S. Standard Certificate of Live Birth allows the reporting of more than one race (multiple race) for each parent (18,19,24,25). The number of multiple-race reporting states increased from 2004 through 2006, as states revised their certificates (14–16). Data from the vital records of the remaining jurisdictions, which include Alabama, Louisiana, and Mississippi, are based on the 1989 revision of the U.S. Standard Certificate of Live Birth which allows only a single race to be reported (18,19). However, births to residents of Alabama, Louisiana, and Mississippi occurring in multiple-race reporting states, which had adopted the 2003 revision, are included. In order to provide uniformity and comparability of the data, it is necessary to "bridge" or impute the responses of those who reported more than one race (multiple race) to a single race. Information on the processing and tabulation of data by race is presented elsewhere (20–23).

Marital status

National estimates of births to unmarried women are based on two methods of determining marital status. Birth certificates in 48 states and the District of Columbia included a direct question about the mother's marital status; in two of these states, California and Nevada, a direct question is part of the electronic birth registration process but does not appear on certified or paper copies of the birth

certificate. The question in most states is: "Mother married? (At birth, conception, or any time between) (Yes or no)." Marital status is inferred in Michigan and New York. A birth is inferred as nonmarital if a paternity acknowledgment was filed or if the father's name is missing from the birth certificate (listed in respective priority-of-use order).

Education

In this report, data on educational attainment of the mother are based on the 1989 revision of the U.S. Standard Certificate of Live Birth. The 1989 standard certificate item asks for the highest grade (i.e., year) completed at the time of birth; the 2003 certificate item asks for the highest degree or level of school completed at the time of the birth (e.g., high school diploma, bachelor's degree, etc.). Due to issues of comparability between revisions, educational attainment data from outside of the reporting area, that is, in a jurisdiction that has adopted the 2003 U.S. Standard Certificate of Live Birth, are excluded; see "1989 and 2003 revisions of U.S. Standard Certificate of Live Birth."

Prenatal care

Data on the month that prenatal care began are based on the 1989 revision of the U.S. Standard Certificate of Live Birth, which asks the mother for the month of pregnancy in which prenatal care began; the 2003 certificate item asks for the date of the first prenatal care visit, with medical records as the source of this information. Due to issues of comparability between revisions, prenatal care data from outside of the reporting area, that is, in a jurisdiction that has adopted the 2003 U.S. Standard Certificate of Live Birth, are excluded; see "1989 and 2003 revisions of U.S. Standard Certificate of Live Birth."

Method of delivery

The *total cesarean* rate is computed as the percentage of all births that were delivered by cesarean section. Despite substantive changes in how "method of delivery" data are collected between the 1989 and 2003 revisions of the birth certificate, the numbers and percentages of total vaginal and total cesarean deliveries (i.e., the total cesarean delivery rate) continue to appear to be very consistent between revisions.

Gestation

The primary measure used to determine the gestational age of the newborn is the interval between the first day of the mother's last, normal menstrual period (LMP) and the date of birth. It is subject to error for several reasons, including imperfect maternal recall or misidentification of the LMP because of postconception bleeding, delayed ovulation, or intervening early miscarriage. These data are edited for LMP-based gestational ages which are clearly inconsistent with the infant's plurality and birthweight, but reporting problems for this item persist and may occur more frequently among some subpopulations and among births with shorter gestations (37,38).

Birthweight

Birthweight is reported in some areas in pounds and ounces rather than in grams. However, the metric system has been used in tabulating and presenting the statistics to facilitate comparison with data published by other groups. Detailed information on equivalence of gram weights in terms of pounds and ounces may be found elsewhere (14,15,17,34).

Computation of percentages and percent distributions

Births for which a particular characteristic is unknown were subtracted from the figures for total births that were used as denominators before percentages and percent distributions were computed. Levels of incomplete reporting vary substantially by specific item, jurisdiction area, and race and Hispanic origin.

These levels also exclude all births to residents of the designated area occurring in a jurisdiction that has adopted the 2003 U.S. Standard Certificate of Live Birth (see "1989 and 2003 revisions of U.S. Standard Certificate of Live Birth," "Education," and "Prenatal care").

An asterisk (*) is shown in place of any derived statistic based on fewer than 20 births or, for percentages, fewer than 20 births in the numerator.

Computation of rates

It is not possible to compute reliable, population-based birth or fertility rates for the Hurricane Katrina-impacted areas with the information currently available.

Random variation and significance testing for natality data

The number of births reported for an area is essentially a complete count, because more than 99 percent of all births are registered. Although this number is not subject to sampling error, it may be affected by nonsampling errors in the registration process such as mistakes in recording the mother's residence or age.

When the number of births is used for analytic purposes (i.e., the comparison of numbers and percentages over time, for different areas, or between different groups), the number of events that *actually* occurred can be thought of as one outcome in a large series of possible results that *could have* occurred under the same (or similar) circumstances. When considered in this way, the number of births is subject to random variation and a probable range of values can be estimated from the actual figures, according to certain statistical assumptions.

Testing differences between two numbers

One method of testing the statistical significance of differences between two numbers is to compare the confidence intervals of the numbers.

The confidence interval is the range of values for the number of births that could be expected in 95 out of 100 cases. The confidence limits are the end points of this range of values (the highest and lowest

values). Confidence limits specify how much the number of events could vary under the same (or similar) circumstances.

To compare the number of births, confidence intervals for both numbers are first computed. Confidence limits for numbers can be estimated from the actual number of vital events. Procedures differ depending on the number of births.

One or both of the numbers is based on less than 100 cases—When the number of births is small—based on less than 100 cases—the data are assumed to follow a Poisson probability distribution (39) (see Table I). Confidence limits are estimated using the following formulas:

Lower limit = $B \times L$

Upper limit = $B \times U$

where:

B = number of births
L = the value in Table I that corresponds to the number B
U = the value in Table I that corresponds to the number B

(Note: Considerable caution should be observed in interpreting the occurrence of such infrequent events.)

One or both of the numbers is based on 100 or more cases—When the number of births is large—based on 100 or more cases—the data are assumed to approximate a normal distribution (where the relative standard error is small). Ninety-five percent confidence limits are estimated using the following formulas:

Lower limit = $B - (1.96 \times \sqrt{B})$

Upper limit = $B + (1.96 \times \sqrt{B})$

where:

B = number of births

The intervals are then compared to see if they overlap. If the intervals overlap, the difference is considered not statistically significant at the 95 percent level. If the intervals do not overlap, the difference is considered statistically significant.

Example

Suppose that the number of births to non-Hispanic white women in Winston County, Mississippi, was 118 in the 12-month period before Hurricane Katrina and 86 in the 12-month period that followed.

Table I. Values of *L* and *U* for calculating 95 percent confidence limits for numbers of events and rates when the number of events is 20 or more and less than 100

N	*L*	*U*	*N*	*L*	*U*
20	0.61083	1.54442	60	0.76311	1.28720
21	0.61902	1.52861	61	0.76492	1.28454
22	0.62669	1.51401	62	0.76669	1.28195
23	0.63391	1.50049	63	0.76843	1.27943
24	0.64072	1.48792	64	0.77012	1.27698
25	0.64715	1.47620	65	0.77178	1.27458
26	0.65323	1.46523	66	0.77340	1.27225
27	0.65901	1.45495	67	0.77499	1.26996
28	0.66449	1.44528	68	0.77654	1.26774
29	0.66972	1.43617	69	0.77806	1.26556
30	0.67470	1.42756	70	0.77955	1.26344
31	0.67945	1.41942	71	0.78101	1.26136
32	0.68400	1.41170	72	0.78244	1.25933
33	0.68835	1.40437	73	0.78384	1.25735
34	0.69253	1.39740	74	0.78522	1.25541
35	0.69654	1.39076	75	0.78656	1.25351
36	0.70039	1.38442	76	0.78789	1.25165
37	0.70409	1.37837	77	0.78918	1.24983
38	0.70766	1.37258	78	0.79046	1.24805
39	0.71110	1.36703	79	0.79171	1.24630
40	0.71441	1.36172	80	0.79294	1.24459
41	0.71762	1.35661	81	0.79414	1.24291
42	0.72071	1.35171	82	0.79533	1.24126
43	0.72370	1.34699	83	0.79649	1.23965
44	0.72660	1.34245	84	0.79764	1.23807
45	0.72941	1.33808	85	0.79876	1.23652
46	0.73213	1.33386	86	0.79987	1.23499
47	0.73476	1.32979	87	0.80096	1.23350
48	0.73732	1.32585	88	0.80203	1.23203
49	0.73981	1.32205	89	0.80308	1.23059
50	0.74222	1.31838	90	0.80412	1.22917
51	0.74457	1.31482	91	0.80514	1.22778
52	0.74685	1.31137	92	0.80614	1.22641
53	0.74907	1.30802	93	0.80713	1.22507
54	0.75123	1.30478	94	0.80810	1.22375
55	0.75334	1.30164	95	0.80906	1.22245
56	0.75539	1.29858	96	0.81000	1.22117
57	0.75739	1.29562	97	0.81093	1.21992
58	0.75934	1.29273	98	0.81185	1.21868
59	0.76125	1.28993	99	0.81275	1.21746

Is the number of births after the storm significantly lower than the number of births before the storm? The first step is to compute the confidence intervals for both numbers. Note that the number of births before the event is more than 100 cases but fewer than 100 cases after the event.

	Lower limit	Upper limit
Before	97	139
After	69	106

These two confidence intervals overlap. Therefore, the number of births to non-Hispanic white women in Winston County, Mississippi, after Hurricane Katrina is not significantly lower (at the 95 percent confidence level) than the number of births before the storm.

This method of comparing confidence intervals is a conservative test for statistical significance. That is, the difference between two numbers may, in fact, be statistically significant even though confidence intervals for the two numbers overlap (40). Thus, caution should be observed when interpreting a nonsignificant difference between two numbers, especially when the lower and upper limits being compared overlap only slightly.

Testing differences between two percentages

The significance test for the difference between two percentages is as follows. When testing the difference between two percentages, both percentages must meet these conditions:

$$B \times p \geq 5 \text{ and } B \times q \geq 5$$

where:

B = number of births in the denominator
p = percent divided by 100
$q = 1 - p$

When both percentages meet these conditions, then the absolute difference between the two percentages is considered statistically significant if it is greater than the statistic in the formula below. This statistic equals 1.96 times the standard error for the difference between two percentages.

$$1.96 \times \sqrt{P \times (1 - P) \times \left(\frac{1}{B_1} + \frac{1}{B_2}\right)}$$

where:

B_1 = number of births in the denominator of the first percentage
B_2 = number of births in the denominator of the second percentage

$$P = \frac{B_1 \times p_1 + B_2 \times p_2}{B_1 + B_2}$$

p_1 = first percentage divided by 100
p_2 = second percentage divided by 100

Example

Is the percentage of births by cesarean delivery to non-Hispanic black women for the total FEMA-designated area in Louisiana after the storm (33.0 percent) significantly lower than the percentage of births before the storm (34.2 percent)? Suppose that the number in the denominator was 17,716 before the storm and 14,038 after the storm. The necessary conditions are met for both percentages (calculations not shown). The difference between the two percentages is $|0.330 - 0.342| = 0.012$. The statistic is then calculated as:

$$= 1.96 \times \sqrt{0.337 \times 0.663 \times 0.000127681}$$
$$= 1.96 \times \sqrt{0.000028528}$$
$$= 1.96 \times 0.005$$
$$= 0.010$$

The difference between the percentages (0.012) is more than this statistic (0.010). Therefore, the difference is statistically significant at the 95 percent confidence level.

Contents

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